POLYMER-LAYER SILICATE NANOCOMPOSITES IN SOLUTION: LINEAR PEO AND HIGHLY BRANCHED DENDRIMER FOR ORGANIC WASTEWATER TREATMENT

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ABSTRACT

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Based on the concept of organic matter adsorption from aqueous systems, highly active site species were required for good adsorption of organic waste in water. Poly(amidoamine) (PAMAM) dendrimer, the highly-branched structure that emanates from a central core, was used in cooperation with montmorillonite (MMT), a smectite clay of high surface area in nanocomposite form which acts as an effective adsorbent in organic wastewater treatment applications. Due to the inorganic character of MMT, the organic adsorption ability of MMT was improved by replacing the exchangeable cations via an ion-exchange reaction with octadecylamine and di(hydrogenated tallow)dimethylammonium chloride. These modifying agents differ in their chemical structures. The PAMAM/MMT nanocomposites (prepared by solution technique) were compared with poly(ethylene oxide)/MMTs, the nanocomposites with linear polymer molecules (prepared by melt technique) for organic waste adsorption. All nanocomposites were characterized using WAXS, TGA and FT-IR. The viscosity of the nanocomposites in aqueous solution was studied. The ability to remove organic contaminants from aqueous solution, based on different molecular structures of organically modified clays (PAMAM/MMTs and linear PEO/MMT nanocomposites), were evaluated using UV/VIS spectroscopy.

บทคัดย่อ

กรวัลลิ์ รัตนะรัต: การกำจัดสารอินทรีย์ในน้ำเสียโดยใช้พอลิเอทิลีนออกไซด์และเดนไดรเมอร์สำหรับพอลิเมอร์-เลเยอร์ซิลิเกตนาโนคอมพอสิทในสารละลาย (Polymer-Layer Silicate Nanocomposites in Solution: Linear PEO and Highly Branched Dendrimer for Organic Wastewater Treatment) อ. ที่ปรึกษา: ผศ.ดร. รัตนวรรณ มกรพันธ์, ดร. มานิตย์ นิธิธนากุล และ รศ.ดร. เดวิด ซี มาร์ติน 67 หน้า ISBN 974-17-2326-1

สิ่งสำคัญสำหรับสารที่ใช้ดูดซับสารอินทรีย์ในกระบวนการบำบัดน้ำเสียคือการมีหมู่ที่ว่องไวในการทำปฏิกิริยามาก พอลิอะมิโดแอมีนซึ่งเป็นพอลิเมอร์ที่มีกิ่งสาขาแผ่ขยายออกจากศูนย์กลาง (เดนไดรเมอร์) จึงถูกนำมาใช้ร่วมกับมอนด์มอริลโลไนด์ ซึ่งเป็นดินกลุ่มซีแมกไท์ที่มีพื้นที่ผิวสูงในรูปนาโนคอมพอสิทสำหรับเป็นสารดูดซับสารอินทรีย์ในน้ำเสียที่มีประสิทธิภาพ เนื่องจากความเป็นสารอนินทรีย์ของมอนด์มอริลโลไนด์ จึงต้องมีการปรับปรุงความสามารถในการดูดซับสารอินทรีย์โดยการแลกเปลี่ยนประจุบวกของสารอนินทรีย์ที่มีอยู่ในโครงสร้างของมอนด์มอริลโลไนด์ด้วยสารประกอบพวกแอมีนได้แก่ octadecylamine และ di(hydrogenated tallow) dimethylammonium chloride การศึกษาครั้งนี้ได้ทำการเปรียบเทียบนาโนคอมพอสิทของพอลิอะมิโดแอมีนกับดินซึ่งเตรียมโดยวิธีสารละลายกับนาโนคอมพอสิทของพอลิเอทิลีนออกไซด์ซึ่งเป็นพอลิเมอร์ที่มีโครงสร้างเป็นเส้นกับดินซึ่งเตรียมโดยวิธีหลอมเหลว โดยใช้ WAXS, TGA และ FT-IR และศึกษาลักษณะของนาโนคอมพอสิทในน้ำโดยดูจากความหนืดของสารละลาย นอกจากนี้ยังศึกษาความสามารถในการดูดซับสารอินทรีย์ของนาโนคอมพอสิทที่ใช้ดินที่ถูกปรับปรุงสภาพและพอลิเมอร์ต่างชนิดกัน โดยใช้ UV/VIS spectroscopy

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ABBREVIATIONS

Meq	=	Milliequivalent
MMT	=	Montmorillonite
Na-MMT	=	Sodium montmorillonite
OC	=	Octadecylamine
OC-MMT	=	Octadecylamine modified montmorillonite
OH	=	Di(hydrogenated tallow)dimethylammonium chloride
OH-MMT	=	Di(hydrogenated tallow)dimethylammonium chloride modified montmorillonite
PAMAM	=	Poly(amidoamine)
PEO	=	Poly(ethylene oxide)